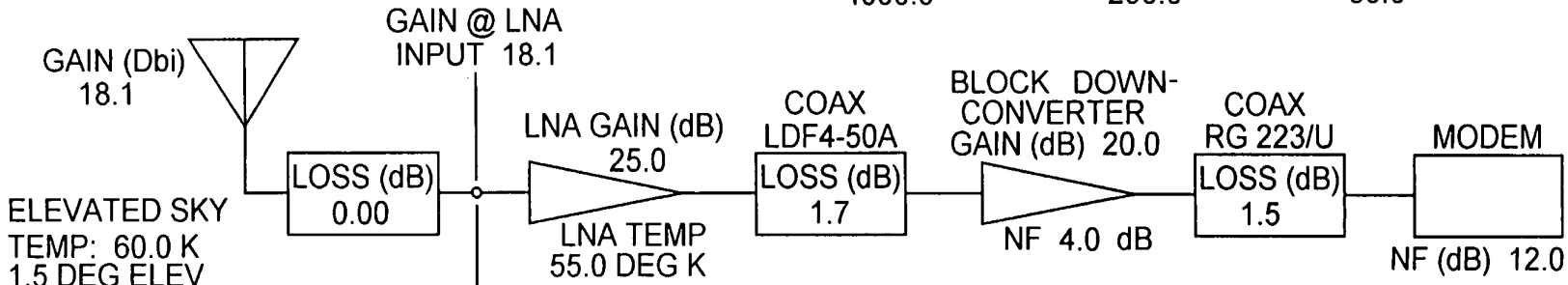
ANTENNA PERFORMANCE

8x8 ARRAY

ELEMENT	SIZE (in)	ELEMENTS	GAIN	FREQUENCY (MHz)	AMBIENT TEMP (K)	ANTENNA EFF (%)
SQUARE: 8	11.8	64	18.06 dB	4000.0	290.0	80.0



LOSS BUDGET (dB)						
HORN	0.02	55.0 +	141.9 +	438.4 +	119.6 +	4306.2
HYBIRD POL	0.02		316.2 +	212.3 +	21232.4 +	15031.4
BEND	0.05					
COUPLER	0.05	55.0 +	0.4 +	2.1 +	0.0 +	0.3
VSWR	0.08					
		T_{rs} → 57.8 K				
TOTAL	0.22					

$T_{sys} = T_{ant} + T_{rs} = 232.8\ K = 23.7\ dB$ G/T = - 5.61 dB/K

FIG. 1

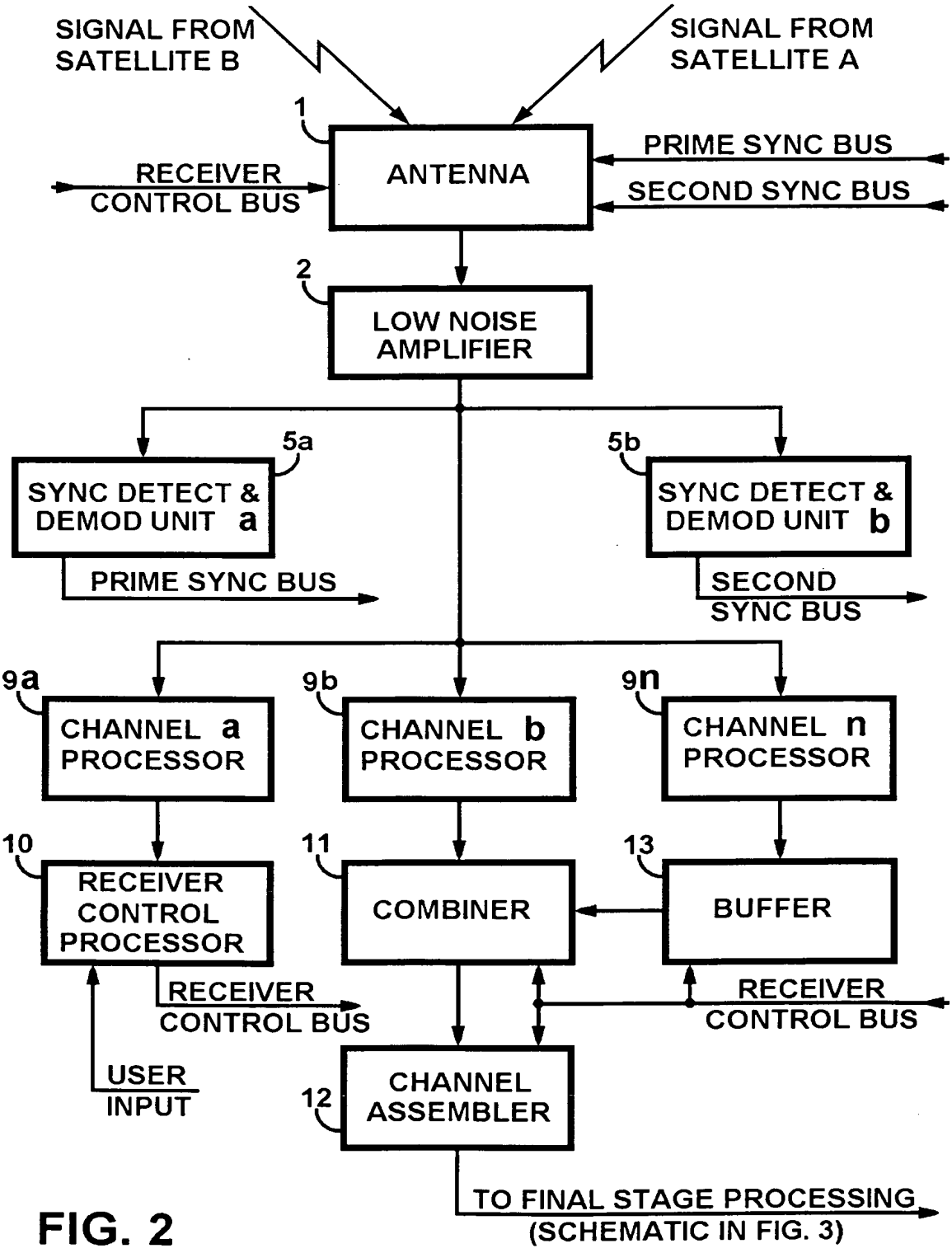

SIGNAL FROM SATELLITE B
SIGNAL FROM SATELLITE A
1
ANTENNA
RECEIVER CONTROL BUS
PRIME SYNC BUS
SECOND SYNC BUS
2
LOW NOISE AMPLIFIER
5a
SYNC DETECT & DEMOD UNIT a
5b
SYNC DETECT & DEMOD UNIT b
PRIME SYNC BUS
SECOND SYNC BUS
9a
CHANNEL a PROCESSOR
9b
CHANNEL b PROCESSOR
9n
CHANNEL n PROCESSOR
10
RECEIVER CONTROL PROCESSOR
11
COMBINER
13
BUFFER
RECEIVER CONTROL BUS
RECEIVER CONTROL BUS
USER INPUT
12
CHANNEL ASSEMBLER
TO FINAL STAGE PROCESSING
(SCHEMATIC IN FIG. 3)

FIG. 2

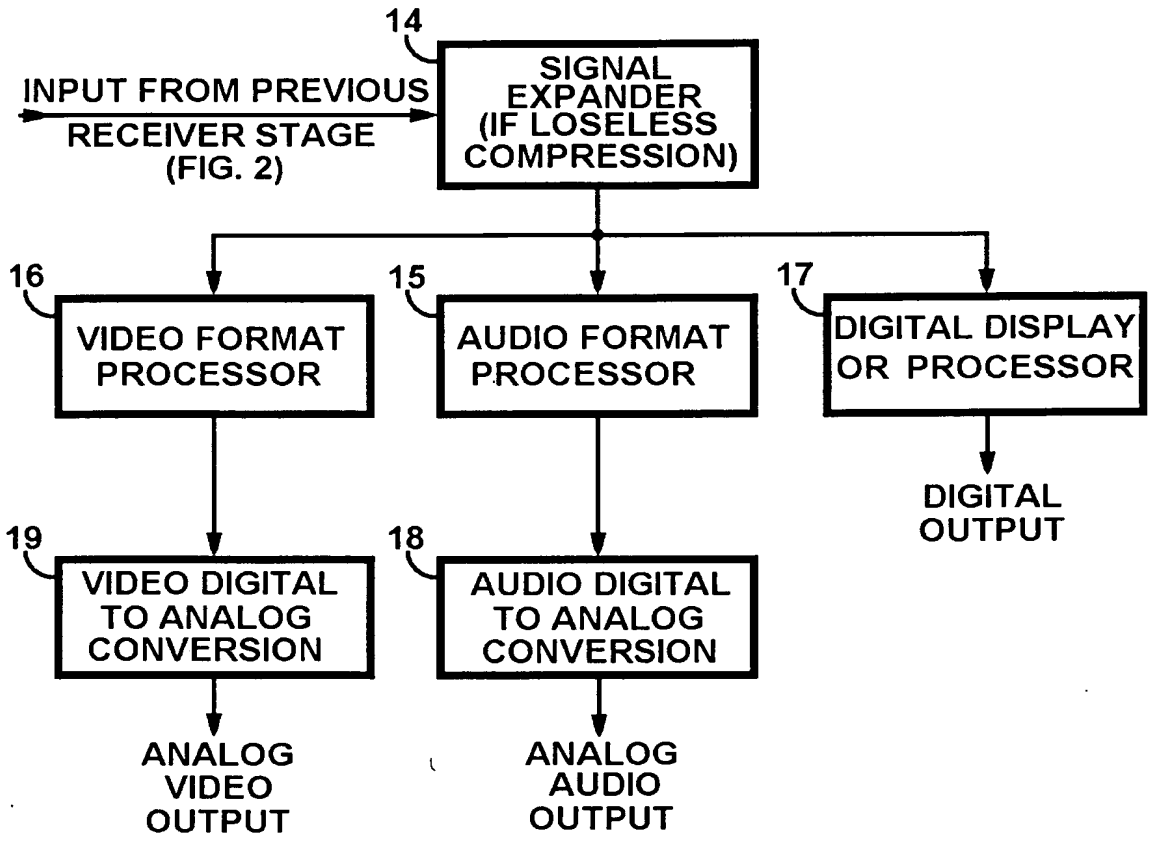
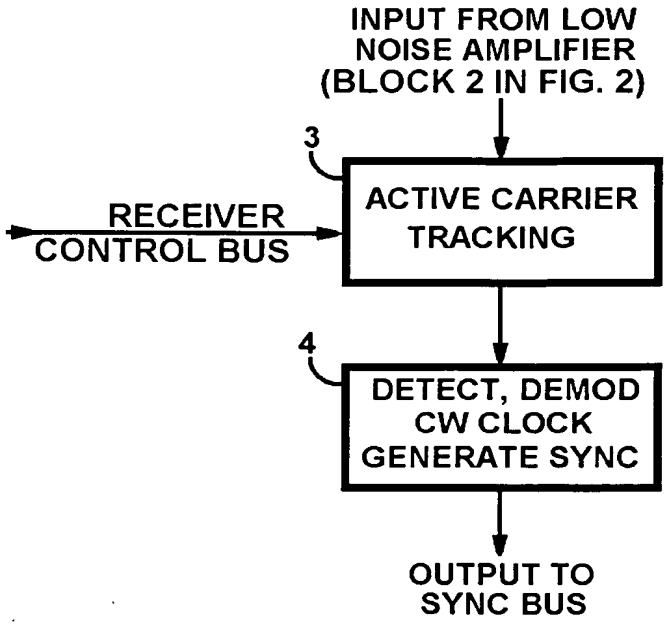

14
INPUT FROM PREVIOUS
RECEIVER STAGE
(FIG. 2)
SIGNAL EXPANDER (IF LOSELESS COMPRESSION)
16
VIDEO FORMAT PROCESSOR
15
AUDIO FORMAT PROCESSOR
17
DIGITAL DISPLAY OR PROCESSOR
DIGITAL OUTPUT
19
VIDEO DIGITAL TO ANALOG CONVERSION
18
AUDIO DIGITAL TO ANALOG CONVERSION
ANALOG VIDEO OUTPUT
ANALOG AUDIO OUTPUT

FIG. 3



ABOVE: DETAIL OF SYNC DETECT AND DEMOD UNITS (BLOCK 5 IN FIG. 2)

FIG. 4

BELOW: DETAIL OF CHANNEL PROCESSORS (BLOCK 9 IN FIG. 2)

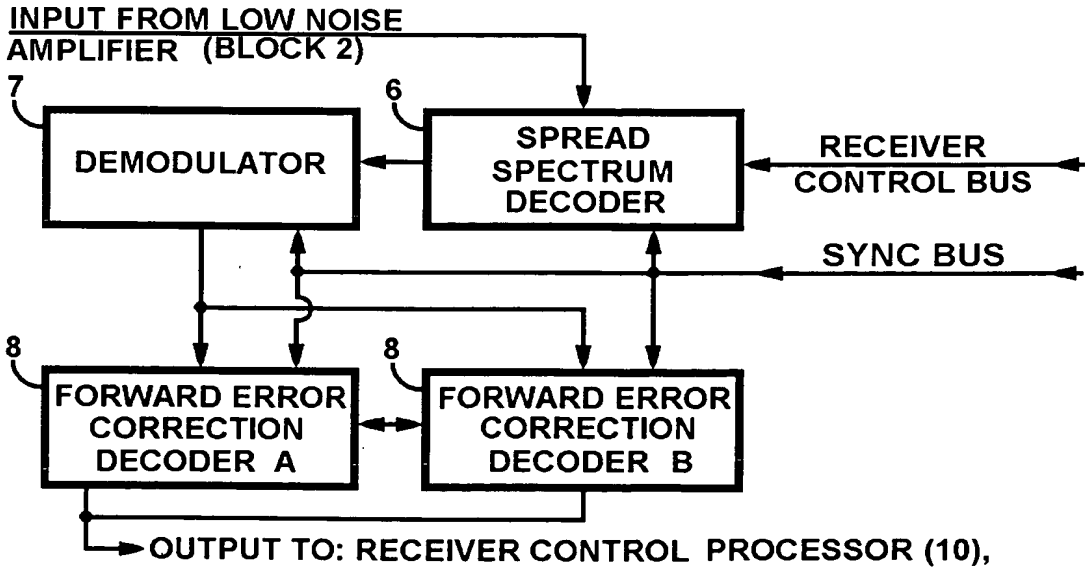


FIG. 5

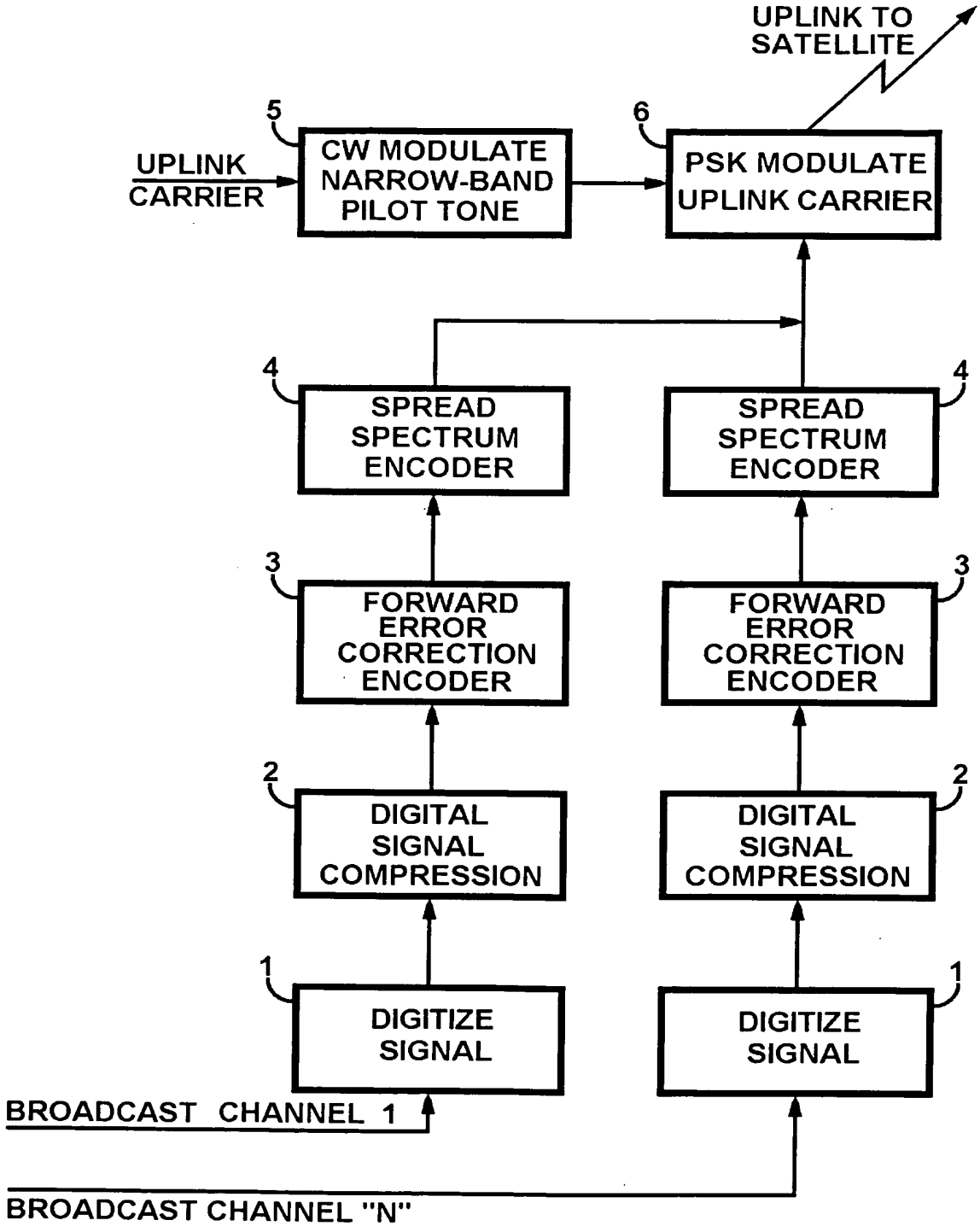

UPLINK TO SATELLITE
5
6
UPLINK CARRIER
CW MODULATE NARROW-BAND PILOT TONE
PSK MODULATE UPLINK CARRIER
4
4
SPREAD SPECTRUM ENCODER
SPREAD SPECTRUM ENCODER
3
3
FORWARD ERROR CORRECTION ENCODER
FORWARD ERROR CORRECTION ENCODER
2
2
DIGITAL SIGNAL COMPRESSION
DIGITAL SIGNAL COMPRESSION
1
1
DIGITIZE SIGNAL
DIGITIZE SIGNAL
BROADCAST CHANNEL 1
BROADCAST CHANNEL "N"

FIG. 6

STEP	WHERE	ACTION	SIGNAL PROCESS
1	AUDIO PROCESSOR	DIGITIZE AUDIO SOURCE	SAMPLING TO 22.05-kHz AUDIO @ NYQUIST RATE (44.1- kHz RATE)
2	AUDIO PROCESSOR	DIGITIZE AUDIO SOURCE	QUANTIZATION: 16 BITS PER SAMPLE (65,536 LEVELS)
3	AUDIO PROCESSOR	COMPRESS AUDIO	MPEG-4 ADVANCED AUDIO CODING (AAC) (INCORPORATES HUFFMAN CODING, UNEQUAL ERROR PROTECTION (UEP)) 24-kbps PER HIGH QUALITY (4.2 ON SCALE OF 5) MUSIC CHANNEL
4	AUDIO PROCESSOR	(BASE-BAND)	USE ADAPTIVE TRANSFORM FREQUENCY DOMAIN CODING, FLOATING POINT TO EMPHASIZE PRIMARY AUDIO COMPONENTS > BLOCKED PACKETS
5	AUDIO PROCESSOR	ADD SPEECH CHANNELS	NARROWBAND CODE EXCITED LINEAR PREDICTION (CELP) CODING: 6 TO 8- kbps PER CHANNEL (3 TO 4 CHANNELS IN LIEU OF ONE MUSIC CHANNEL)
6	AUDIO PROCESSOR	ADD NON-AUDIO DIGITAL CHANNELS	VARIABLE SIZE CHANNELS (RATES) CARRYING BROADCAST DIGITAL DATA
7	AUDIO PROCESSOR	ADD RECEIVER CONTROL CHANNEL	24- kbps CHANNEL ALLOCATED PER TRANSPONDER FOR CONTROL INFORMATION
8	UPLINK PROCESSOR	CHANNEL CODING	FORWARD ERROR CORRECTION (FEC); RECURSIVE, SYSTEMATIC, CONVOLUTIONAL (RSC) TURBO CODE, RATE 1/4, LENGTH 15, DESIGN FOR 10^{-5} BER, PARALLEL CONCATENATED CONVOLUTIONAL CODES (PCCC)
9	UPLINK PROCESSOR	CHANNEL CODING	USE PUNCTURED CONVOLUTIONAL CODING TO PERMIT EQUAL ERROR PROTECTION (EEP) & UNEQUAL ERROR PROTECTION (UEP)
10	UPLINK PROCESSOR	CHANNEL CODING	UPLINK BLOCK LENGTH DYNAMICALLY ADAPTED
11	UPLINK PROCESSOR	SIGNAL SPREADING	DIRECT SEQUENCE SPREAD SPECTRUM CODE DIVISION MULTIPLE ACCESS (DSSS CDMA) - SPREAD EACH CHANNEL TO 36-MHz

(TABLE CONTINUED ON NEXT SHEET)

FIG. 7A

STEP	WHERE	ACTION	SIGNAL PROCESS
12	UPLINK PROCESSOR	CHANNEL COMBINING	COMBINE WITH OTHER CHANNELS – NUMBER OF CHANNELS DETERMINED BY SAT EIRP, USER ANTENNA SIZE
13	UPLINK PROCESSOR	MODULATE UPLINK	MODULATE UPLINK CARRIER – BINARY PHASE SHIFT KEY (BPSK)
14	UPLINK PROCESSOR	ADD SYNC TONE	ADD PILOT TONE (CENTER FREQ)
15	UPLINK TRANSMITTER	UPLINK	TRANSMIT TO SPACECRAFT
16	S/C TRANS-PONDER	RECEIVE, TURN-AROUND	SPACECRAFT TRANSPONDER TURNAROUND
17	S/C TRANS-PONDER	RE-TRANSMIT	37 – 42 dBw EIRP
18	RECEIVER ANTENNA	RECEIVE SIGNAL	RECEIVER ANTENNA RECEIVE PILOT TONE, PHASE ANTENNA
19	RECEIVER ANTENNA	DETECT, SYNCHRO-NIZE CARRIER SIGNAL	DETECT SIGNAL PHASE, SYNCHRONIZE RECEIVER CLOCK, ACTIVE CARRIER TRACKING (CRITICAL STEP)
20	RECEIVER ANTENNA	DOWN-CONVERT	DOWNCONVERT SIGNAL TO 70 MHz IF
21	RECEIVER	BIT SYNCHRO-NIZATION	SYNCHRONIZE BIT STREAM TO ENABLE SIGNAL DETECTION AND DECODING
22	RECEIVER	DECODE SIGNAL	MAXIMUM A POSTERIORI ALGORITHM (MAP) DECODING
23	RECEIVER	DECODE SIGNAL	DETECT DESIRED CHANNEL—SPECIFIC CDMA CODE
24	RECEIVER	DECODE SIGNAL	USE BACKWARD ADAPTIVE BIT ALLOCATION
25	RECEIVER	DECODE SIGNAL	RECONSTRUCT COMPRESSED AUDIO SIGNAL
26	RECEIVER	DECOM-PRESS	EXPAND TO UNCOMPRESSED AUDIO
27	RECEIVER	D – A CON-VERSION	DIGITAL TO ANALOGUE CONVERSION
28	RECEIVER	PLAYBACK	FEED PLAYBACK SYSTEM
29	RECEIVER	ANCILLARY FUNCTIONS	VERIFY AUTHORIZATION TO RECEIVE DESIRED CHANNEL

(TABLE CONCLUDED ON NEXT SHEET)

FIG. 7B

STEP	WHERE	ACTION	SIGNAL PROCESS
30	RECEIVER	ANCILLARY FUNCTIONS	IDENTIFY INTELLECTUAL PROPERTY RIGHTS
31	RECEIVER	ANCILLARY FUNCTIONS	STRIP AND DISPLAY ANCILLARY CHANNEL INFORMATION
32	RECEIVER	ANCILLARY FUNCTIONS	DETERMINE IF WARNING CHANNEL SHOULD PRE-EMPT

(END OF TABLE)

FIG. 7C